

Amendments to the Claims:

1. (Currently Amended) An apparatus for guiding the movement of a surgical tool in relation to the anatomy of a patient, the apparatus comprising:
- a surgical tool;
- a display remote from the tool for displaying a diagnostic image of the
- 5 anatomy;
- a means for superimposing at least one of a proposed target and a
- proposed trajectory indicative of a desired position of the tool;
- means for determining an actual position of the tool;
- means for determining a difference between the actual position of the tool
- 10 and ~~[[a]]~~ the desired position of the tool; and,
- indicating means different from the remote display and mounted on
- ~~associated with~~ the tool for indicating to a human the difference between the actual
- and desired positions of the tool, the indicating means having an indicator reference
- frame different from the remote display frame of reference, the difference being
- 15 indicated with respect to the indicator reference frame.

2-6. (Cancelled)

7. (Previously Presented) The apparatus of claim 1 wherein the indicating means comprises at least one indicator.

8. (Cancelled)

9. (Previously Presented) The apparatus of claim 7 wherein the at least one indicator is mounted to a patient support.

10. (Cancelled)

11. (Currently Amended) The apparatus of claim [[10]] 1 wherein the means for determining the actual position of the tool comprises one of an infrared localizer and an articulated arm.

12. (Previously Presented) The apparatus of claim 1 wherein the actual and desired positions include at least one of a location, trajectory, depth, and rotation of the tool.

13. (Previously Presented) The apparatus of claim 1 wherein the indicating means comprises a position indicator and a mode indicator.

14. (Cancelled)

15. (Currently Amended) An apparatus for guiding the movement of a surgical tool in relation to the anatomy of a patient, the apparatus comprising:

[[the]] a surgical tool, having wherein the surgical tool includes a pointing axis;

5 a position determining means for determining an actual position and orientation of the surgical tool;

a difference determining means for determining a difference between the actual position and orientation of the surgical tool and a desired position and orientation of the surgical tool; [[and,]]

10 at least two electronic indicators mounted to the surgical tool in a plane substantially orthogonal to the pointing axis, the indicators being connected with the difference determining means to indicate the determined difference, in a frame of reference of the surgical tool; and

15 a display different from the electronic indicators which displays at least the actual position of the surgical tool and the desired position of the surgical tool.

16-21. (Cancelled)

22. (Previously Presented) An apparatus for use with an image guided surgery system, the apparatus comprising:

a surgical tool;

5 first and second display members associated with the tool and arranged along a first line and third and fourth display members associated with the tool and arranged along a second line, the first and second lines being perpendicular, the display members providing to a human operator an indication of a direction in which the tool should be moved to reach a desired position;

a mechanism for determining an actual position of the surgical tool;

10 a processor programmed to update the tool position, to control the first, second, third, and fourth display members, as the tool moves, to indicate deviations from a planned trajectory in a frame of reference of the display members.

23-25. (Cancelled)

26. (Previously Presented) A method for guiding the movement of a surgical tool with respect to the anatomy of a patient having a patient reference frame, the method comprising the steps of:

5 determining a desired position of the tool based on an image of the anatomy of a patient, the image having an image reference frame;

correlating the image and patient reference frames;

determining an actual position of the tool;

determining a direction in which the tool must be moved to reach the desired position;

10 determining an actual position of a human readable position display disposed remote from the tool having a display reference frame; and

utilizing the human readable position display to indicate the direction in which the tool must be moved to reach the desired position, said indication being provided in relation to the display reference frame.

27-28. (Cancelled)

29. (Previously Presented) A method for guiding the movement of a surgical tool with respect to the anatomy of a patient having a patient reference frame, the method comprising the steps of:

- 5 displaying an image of the anatomy of the patient on a display disposed remote from the surgical tool;
- determining a desired position of a tip of the tool based on the displayed image;
- electronically determining a direction the tool must be moved for the tip to reach a desired position;
- 10 determining an actual position of a position indicator having an indicator reference frame, wherein the position indicator is mounted to the tool and the step of determining an actual position of the position indicator includes determining an actual position of the tip of the tool; and
- utilizing the position indicator to indicate to a human the magnitude of the
- 15 distance the tool must be moved for the tip to reach the desired position, said indication being provided in relation to the indicator reference frame, wherein said indication is provided by varying one of blink rate and color of an indicator visible to a user.

30. (Cancelled)

31. (Currently Amended) The method of claim 26 wherein the human readable position display includes a plurality of light emitting diodes ~~mounted to the tool.~~

32-41. (Cancelled)

42. (Currently Amended) An apparatus comprising:
a surgical tool;
~~a display~~ direction indicators attached to the tool for rotation therewith;

a mechanism for locating an actual location and orientation of a distal
5 end of the tool with its attached display; and

a mechanism for causing the ~~display~~ direction indicators attached to the
tool to indicate to a human a direction in a frame of reference of the tool ~~and the~~
~~display~~ in which the tool should be ~~translated~~ moved for the distal end to travel on a
desired trajectory to a desired position; and,

10 a display which displays at least the actual location of the distal end and
the desired position in a fixed frame of reference such that an orientation of the
display remains fixed as the tool moves and rotates.

43. (Currently Amended) The apparatus of Claim 42, wherein the
display direction indicators comprise[[s]] a plurality of indicators disposed at angular
intervals surrounding a central point.

44. (Currently Amended) An apparatus comprising:
a tool for use in connection with surgery;
a first display remote from the tool which displays an anatomical image
including target anatomy and a desired trajectory to be followed while moving the
5 tool to the target anatomy;

a mechanism for locating an actual position of the tool relative to the
target anatomy as the tool is moved toward the target anatomy;

a second display ~~associated with~~ mounted on the tool for indicating
differences between the actual position of the tool and the desired trajectory, wherein
10 said differences are indicated with respect to the tool; and

a mechanism for causing the second display to indicate to a human a
direction in a frame of reference of the second display which the tool should be
moved to reach the target anatomy.

45. (Currently Amended) A method for guiding the movement of a
surgical tool, said method comprising:

tracking a surgical tool with reference to a patient's anatomy;

determining a direction in which the surgical tool should be moved from
5 an actual position for a distal end to reach a desired position with respect to the
patient, the desired position being indicated with reference to a diagnostic image of
the patient displayed on a display remote from the surgical tool in a frame of
reference which is fixed relative to a frame of reference of the patient's anatomy; and
activating a display on the surgical tool adjacent a handle end to indicate
10 the direction in a frame of reference of the tool in which a handle end of the tool
should be moved to move a distal end of the tool from the determined actual position
to reach the desired position, the tool frame of reference changing relative to the
frame of reference of the diagnostic image and the patient's anatomy with movement
of the tool.

46. (Cancelled)

47. (Currently Amended) An apparatus, comprising:

a hand-held surgical tool with an associated display operable to have a tip
portion inserted into a patient;

a tool position tracker for tracking a position and orientation of the hand-
5 held tool and the associated display with respect to a reference frame; and

the display being configured to produce a visual indication of a direction
in which a hand-held portion of the tool should be moved for the tip to reach a desired
position based at least in part on the position and orientation of the tool as determined
by the tool position tracker, the indicated direction being relative to a reference frame
10 of the hand-held surgical tool which surgical tool frame of reference changes relative
to a frame of reference of the patient as the surgical tool moves relative to the patient.

48. (Previously Presented) The apparatus of claim 15, further including
at least two pairs of electronic indicators.

49. (Currently Amended) The apparatus of claim 42, wherein the
display ~~mechanism~~ includes a plurality of light emitting elements attached to the tool

demarcating at least two different axes such that illumination of the light emitting elements is indicative of the direction in which the tool should be translated.